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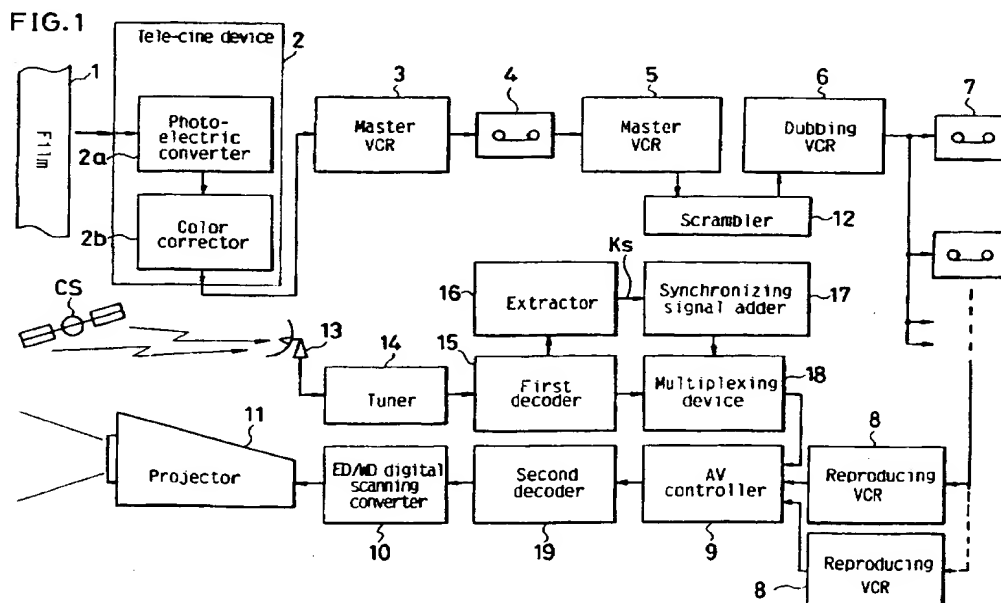
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**Video theater system and reproducing apparatus therefor.**

The video theater system of the present invention has a reproducing apparatus by which picture reproduced from a distribution tape and picture received from a communication satellite are alternatively put on the screen. A scrambled signal transmitted from the communication satellite is converted

to a scrambled signal of the same form signal as the scrambled signal reproduced from the distribution tape, thus enabling a common decoder to descramble both the two signals coming from different input routes from each other.



## FIELD OF THE INVENTION AND RELATED ART STATEMENT

### 1. FIELD OF THE INVENTION

The present invention relates to a video theater system in which a distribution tape made by the tele-cine (photo-electric conversion) device for a movie film etc. is put on a screen.

### 2. DESCRIPTION OF THE RELATED ART

In Japan, there were approximately seven thousand and five hundred movie theaters in the period from 1955 to 1964, and the film industry in those days occupied the leading part in the picture amusement industry of Japan. However thereafter, the leading part has changed from the movies to television. Further, in recent years the rental business of video cassette tape of a movie has become popular. As a result, the number of the movie theaters in Japan decreased to one thousand, nine hundred and twelve in 1989.

On the other hand in the United States, the movie business has made a growth through the improvement of movie theater equipments and the newly-establishment of the multiplex theaters. In those years, the number of the movie theaters has increased from approximately twenty thousand to twenty-four thousand, and an income of the film industry increased as a whole.

To stop the aforementioned declination of the film industry, the Japanese cinema companies have made several countermeasures such as technical improvements of the movie theater equipments, preparation of luxurious seats and establishment of miniature theaters. However, with all such efforts, there has been little effect yet.

In the above-mentioned circumstances, there has appeared video theaters, which projects image on the screen by utilizing a video cassette tape in place of a film, in various parts of the country. These video theaters are established in the form of combination with a supermarket or a large store etc. rather than an independent movie theater. Each of these video theaters has approximately one hundred seats, and projection of the cinema is automatically operated.

Hereafter, system of the video theater is described. FIG.4 is a block diagram showing making and reproducing system of a video tape which is to be distributed to the video theater. In FIG.4, pictures on a film are converted into electric signals by a tele-cine device 2 including a photo-electric converter 2a and a color corrector 2b. The tele-cine device 2 applies photoelectric conversion to pictures on the film and makes color correction to improve color reproducibility. Electric signals is-

sued from the tele-cine device 2 are recorded in a master tape 4 by a master VCR (Video Cassette Recorder) 3 such as a digital VCR. Next, the electric signals recorded in the master tape 4 are reproduced by another master VCR 5, and many distribution tapes 7 are made by a dubbing VCR 6. For instance, an M2-format VCR such as a type AU-650 by Matsushita Electric Industries is used as the dubbing VCR 6. These distribution tapes 7 are distributed to the video theater to be put on the screen. In the video theater, several M2-format reproducing VCRs 8 are used to reproduce signals recorded in the distribution tapes 7. An AV controller 9 selects video signals which are to be reproduced by the reproducing VCRs 8. Video signals selected by the AV controller 9 are input to an ED (Enhanced Definition) / WD (Wide Display) digital scanning converter 10 to thereby get a progressive scanning for double density; and resultant video signals are projected by a projector 11.

However, there is a problem in the above-mentioned conventional system. That is, since management of the distribution tape 7 is entrusted to a manager of the video theater, it is easy to secretly make illegal dubbing from the distribution tape 7. This may result in interference with rental video business. Protection against the illegal dubbing may be applied to some video tapes. But, many of these video tapes have only simple protection for the video-theater in horizontal synchronizing signals of video signals. Since the image signal itself exists in the tape as it is, it is easy to make a copy tape by taking off the protection.

Further, with spread of the video theaters, many distribution tapes 7 are needed. Therefore, a distribution company has to manage many video tapes, and the screening cost in the theater at a remote place is high.

### OBJECT AND SUMMARY OF THE INVENTION

An object of the present invention is to offer a system which can prevent rampancy of illegal dubbing of cinema etc. and to offer another screening system besides the distribution system which necessitates many video tapes.

In order to achieve the above-mentioned object, a video theater system of the present invention comprises:

reproducing means for reproducing a first scrambled signal recorded in a video tape;

receiving means for receiving a second scrambled signal transmitted from a communication satellite;

signal converting means for removing a copy-protection process from the second scrambled signal to thereby convert the second scrambled signal into a third scrambled signal which is the same

form signal as the first scrambled signal;

selection means for selecting one of the first scrambled signal and the third scrambled signal;

descrambling means for descrambling a signal selected by the selection means into a picture signal; and

display means for displaying a picture based on the picture signal.

According to the above-mentioned video theater system, the scrambled signal transmitted from the communication satellite is converted to the scrambled signal of the same form signal as the scrambled signal reproduced from the video tape. Therefore, both the two signals of different input routes from each other are descrambled by the common descrambling means. It is also an advantage in lowering the screening cost at the remote place that the screening can be realized by the signal transmitted from the communication satellite besides the ordinary screening system dependent on the distribution tape only.

In another standpoint, the present invention offers a reproducing apparatus for the video theater, comprising:

a reproducing video cassette recorder for reproducing a signal recorded in a video tape in a form scrambled by a process of line permutation;

receiving means for receiving a signal transmitted from a communication satellite in a copy-protected form by at least two processes including the line permutation;

a first decoder for removing a copy-protection process other than the line permutation from a signal received by the receiving means;

multiplexing means which extracts a scramble key signal from an output signal of the first decoder and multiplexes a picture signal of the output signal by a signal made by adding a synchronization signal to the scramble key signal;

selection means for selecting one of signals issued from the reproducing video cassette recorder and the multiplexing means;

a second decoder for removing a scrambling process of the line permutation from a signal selected by the selection means; and

display means for displaying a picture based on an output signal of the second decoder.

According to the above-mentioned reproducing apparatus for the video theater, both the two signals of different input routes from each other are descrambled by the common decoder, and very excellent concealment against the illegal recording is realized in a communication satellite transmission system by an intermediate process that the code processing is changed thereat.

While the novel features of the invention are set forth particularly in the appended claims, the invention, both as to organization and content, will

be better understood and appreciated, along with other objects and features thereof, from the following detailed description taken in conjunction with the drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 is a block diagram showing a making process of a distribution tape from a film and a reproducing apparatus for a video theater in a first embodiment.

FIG.2 is a block diagram showing a making process of a distribution tape from a film and a reproducing apparatus for a video theater in a second embodiment.

FIG.3 is an illustration showing a method of the line permutation.

FIG.4 is a block diagram showing the conventional making and reproducing system of a video tape.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Hereafter, preferred embodiments of the present invention are described with reference to the accompanying drawings.

[First embodiment]

FIG.1 is a block diagram showing a making process of a distribution tape 7 from a film 1 and a reproducing apparatus for a video theater by which picture reproduced from the distribution tape 7 and picture received from a communication satellite via radio wave are alternatively put on the screen.

In FIG.1, pictures on the film 1 is converted into electric signals by a tele-cine device 2 including a photo-electric converter 2a and a color corrector 2b. The tele-cine device 2 applies photo-electric conversion to pictures on the film 1 and makes color correction to improve color reproducibility. Electric signals issued from the tele-cine device 2 is recorded in a master tape 4 by a master VCR 3 such as a digital VCR. The electric signals recorded in the master tape 4 are reproduced by another master VCR 5. Next, signals reproduced by the master VCR 5 are scrambled by a scrambler 12. The scrambler 12 includes a circuit for multiplexing the signals by a scramble key signal  $K_s$  (e.g., a random number of 64 bit) which is used at the time of descramble. In this embodiment, scrambling by the line permutation is executed, and the multiplexing by the scramble key signal  $K_s$  is executed during a vertical blanking period of video signals. Signals issued from the scrambler 12 are recorded in many distribution tapes 7 by a dubbing VCR 6.

On the other hand, a communication satellite CS is transmitting scrambled signals. In concrete, scrambling by the line permutation is executed, and copy-protection processes by the synchronization-suppression-and-synchronization-level-shift and the video inversion are executed.

Radio wave transmitted from the communication satellite CS is received by an antenna 13 and thereafter selected by a tuner 14. Signals selected by the tuner 14 are input to a first decoder 15, and thereat the copy-protection (processes) by the synchronization-suppression-and-synchronization-level-shift and the video inversion are decoded (removed). Decoded signals are input to a multiplexing device 18. At the same time, an extractor 16 reads the coded scramble key signal  $K_S$  out of output signals of the first decoder 15. A synchronizing signal adder 17 adds a synchronizing signal of the video signal to the scramble key signal  $K_S$ , and the resultant signals are input to the multiplexing device 18. In the multiplexing device 18, the scramble key signal  $K_S$  with the synchronizing signal added is used to multiplex the video signal scrambled by the line permutation within a vertical blanking period, and the resultant signals are input to an AV controller 9. Output signals issued from a reproducing VCR 8, which reproduces scrambled signals recorded in the distribution tape 7, are also input to the AV controller 9. The AV controller 9 selects and issues one of the scrambled signals coming from the communication satellite CS and the reproducing VCR 8. Output signals issued from the AV controller 9 are descrambled by a second decoder 19 to be restored into the normal video signals. These video signals are input to an ED/WD digital scanning converter 10 and put on the screen by a projector 11.

As has been stated above, the signals transmitted from the communication satellite CS are converted to the scrambled signals of the same form as the signals recorded in the distribution tape 7. Therefore, both the two signals of different input routes from each other are descrambled by a common (second) decoder 19; and software supplied in the form of radio wave transmission and software supplied by the distribution of video cassette are selectively put on the screen. Further, concealments against the illegal dubbing and recording are applied to the distribution tape 7 and the signals transmitted from the communication satellite CS, respectively. Also, the screening cost at the remote place is lowered because the screening can be realized by the signals transmitted from the communication satellite CS besides the ordinary system dependent on the distribution tape 7 only.

Apart from the above-mentioned first embodiment in which the second decoder 19 is disposed outside of the projector 11, another embodiment

may be such that the second decoder 19 is incorporated in the projector 11 or a display (not shown) equivalent to the projector 11.

Although it is probably most preferable in terms of the concealment to execute the descrambling within a casing of the projector 11 (as shown by a projector 21 in FIG.2), there is no particular problem in that the descrambling is executed in the ED/WD digital scanning converter 10 or a stage prior thereto.

#### [Second embodiment]

FIG.2 is a block diagram showing the second embodiment of the present invention. Corresponding parts are labeled with numerals or marks same as the first embodiment, and descriptions thereon made in the first embodiment are similarly applied. In this second embodiment, an encoder 20 is provided, and the projector 21 includes the ED/WD digital scanning converter 10 and the second decoder 19. A making process of the distribution tape 7 and a system from the distribution to the screening are substantially the same as the first embodiment.

Hereinafter, a scrambling method by the line permutation, which is the same as the first embodiment, is described. Scrambling by the scrambler 12 is executed by a process of the line permutation. Since the synchronizing signal of video signals is maintained as it is, recording in the dubbing VCR 6 is carried out by means of the ordinary recording method. FIG.3 is an illustration showing a method of the line permutation. In FIG.3, a usual picture area of each field has 240 pieces of scanning lines. These scanning lines are divided into blocks of 30-line and 60-line. Appearance of these two types of the block is made random, and further randomization is realized by exchanging the scanning lines in each of the blocks at random. Thus, it is made difficult to find a boundary of adjacent blocks. At that time, the scramble key signal is stored within the vertical blanking period, and descrambling is carried out with the help of this scramble key signal to restore the signals. Although copy-protection method for audio is not shown in the figure, a scramble method, in which PN code (pseudorandom code) is added to PCM voice, is used.

In FIG.2, the scramble key signal  $K_S$ , which is extracted by an extractor 16 from the first decoder 15, consists of a block code. This coded scramble key signal  $K_S$  is converted by the encoder 20 to another block code having another code table. The synchronizing signal adder 17 adds a synchronizing signal of the video signal to the block code, and the resultant output is input to the multiplexing device 18. Signals recorded in the distribution tape

7, which are in the similar form scrambled state to signals issued from the multiplexing device 18, are reproduced by the reproducing VCR 8. The signals issued from the multiplexing device 18 and signals issued from the reproducing VCR 8 are input to the AV controller 9 and subjected to the selection. Selected signals are input to the projector 21, which includes the ED/WD scanning converter 10 and the second decoder 19, or the display (not shown) to be put on the screen.

As has been stated above, in the second embodiment, both the two signals of different input routes from each other are descrambled by the common (second) decoder 19, and the concealment against the illegal recording is improved in the communication satellite transmission system by the intermediate process that the code processing is changed thereat.

Although the present invention has been described in terms of the presently preferred embodiments, it is to be understood that such disclosure is not to be interpreted as limiting. Various alterations and modifications will no doubt become apparent to those skilled in the art after having read the above disclosure. Accordingly, it is intended that the appended claims be interpreted as covering all alterations and modifications as fall within the true spirit and scope of the invention.

## Claims

1. A video theater system comprising:
  - reproducing means for reproducing a first scrambled signal recorded in a video tape;
  - receiving means for receiving a second scrambled signal transmitted from a communication satellite;
  - signal converting means for removing a copy-protection process from said second scrambled signal to thereby convert said second scrambled signal into a third scrambled signal which is the same form signal as said first scrambled signal;
  - selection means for selecting one of said first scrambled signal and said third scrambled signal;
  - descrambling means for descrambling a signal selected by said selection means into a picture signal; and
  - display means for displaying a picture based on said picture signal.
2. A video theater system in accordance with claim 1, wherein
  - said first scrambled signal is being scrambled by a process of line permutation; and said second scrambled signal is being scrambled by said process and is processed by at least

one of synchronization-suppression-and-synchronization-level-shift and video inversion.

3. A reproducing apparatus for a video theater comprising:
  - a reproducing video cassette recorder for reproducing a signal recorded in a video tape in a form scrambled by a process of line permutation;
  - receiving means for receiving a signal transmitted from a communication satellite in a copy-protected form by at least two processes including said line permutation;
  - a first decoder for removing a copy-protection process other than said line permutation from a signal, received by said receiving means;
  - multiplexing means which extracts a scramble key signal from an output signal of said first decoder and multiplexes a picture signal of said output signal by a signal made by adding a synchronization signal to said scramble key signal;
  - selection means for selecting one of signals issued from said reproducing video cassette recorder and said multiplexing means;
  - a second decoder for removing a scrambling process of said line permutation from a signal selected by said selection means; and
  - display means for displaying a picture based on an output signal of said second decoder.
4. A reproducing apparatus for a video theater comprising:
  - a reproducing video cassette recorder for reproducing a signal recorded in a video tape in a form scrambled by a process of line permutation;
  - receiving means for receiving a signal transmitted from a communication satellite in a copy-protected form by at least two processes including said line permutation;
  - a first decoder for removing a copy-protection process other than said line permutation from a signal received by said receiving means;
  - encoding means which extracts a scramble key signal from an output signal issued from said first decoder and applies a predetermined encoding to said scramble key signal;
  - a synchronizing signal adder for adding a synchronizing signal to an output signal of said encoding means;
  - a multiplexing device for multiplexing a picture signal of said output signal of the first decoder by an output signal of said synchronizing signal adder;

selection means for selecting one of signals issued from said reproducing video cassette recorder and said multiplexing device;

a second decoder for removing a scrambling process of said line permutation from a signal selected by said selection means; and 5

display means for displaying a picture based on an output signal of said second decoder.

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5. A reproducing apparatus for a video theater in accordance with claim 3, wherein

multiplexing by said scramble key signal is carried out in a vertical blanking period of said picture signal in said multiplexing means. 15

6. A reproducing apparatus for a video theater in accordance with claim 4, wherein

multiplexing by said scramble key signal is carried out in a vertical blanking period of said picture signal in said multiplexing device. 20

7. A reproducing apparatus for a video theater in accordance with claim 3 or 4, wherein

said second decoder is incorporated in a casing of said display means. 25

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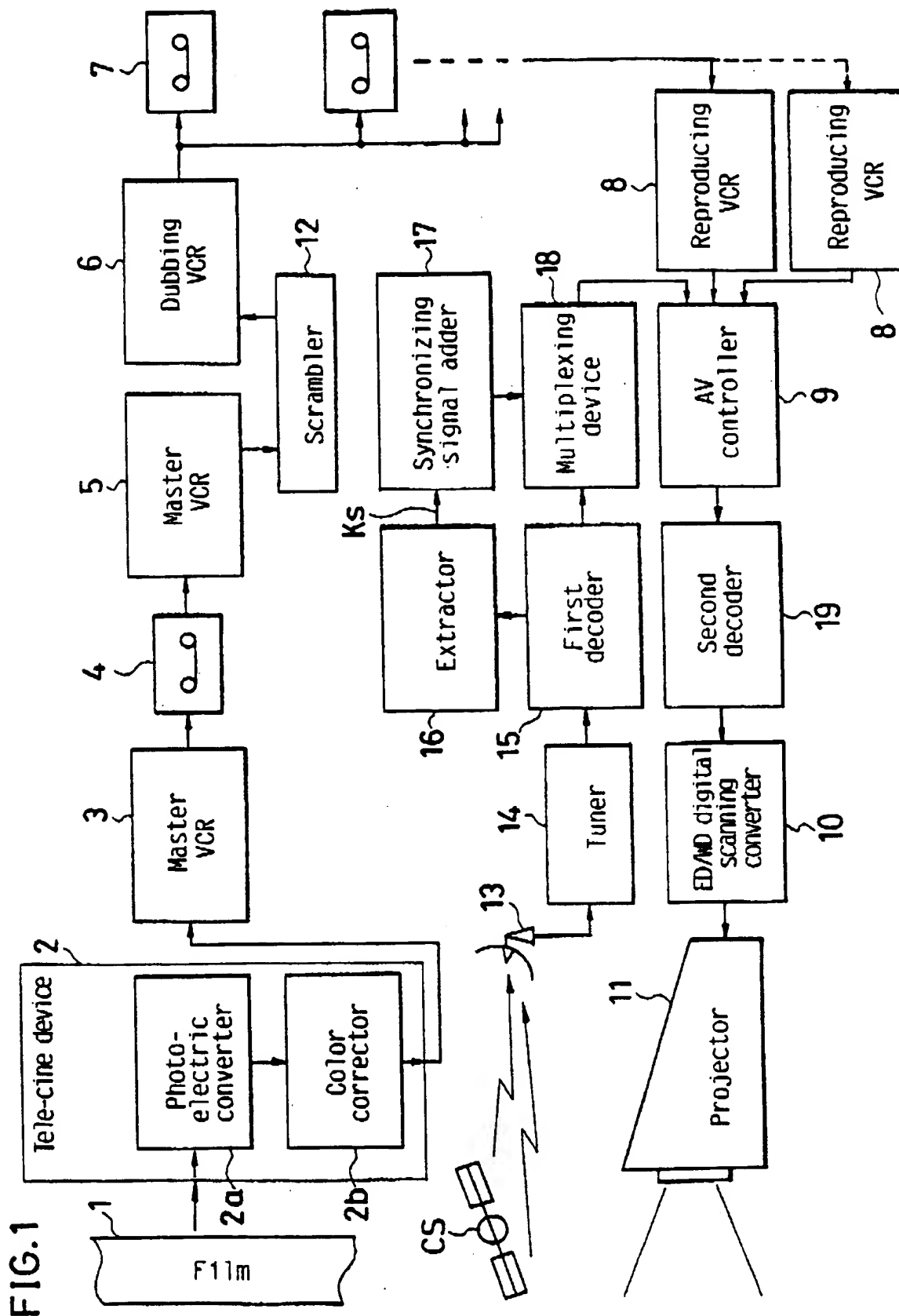
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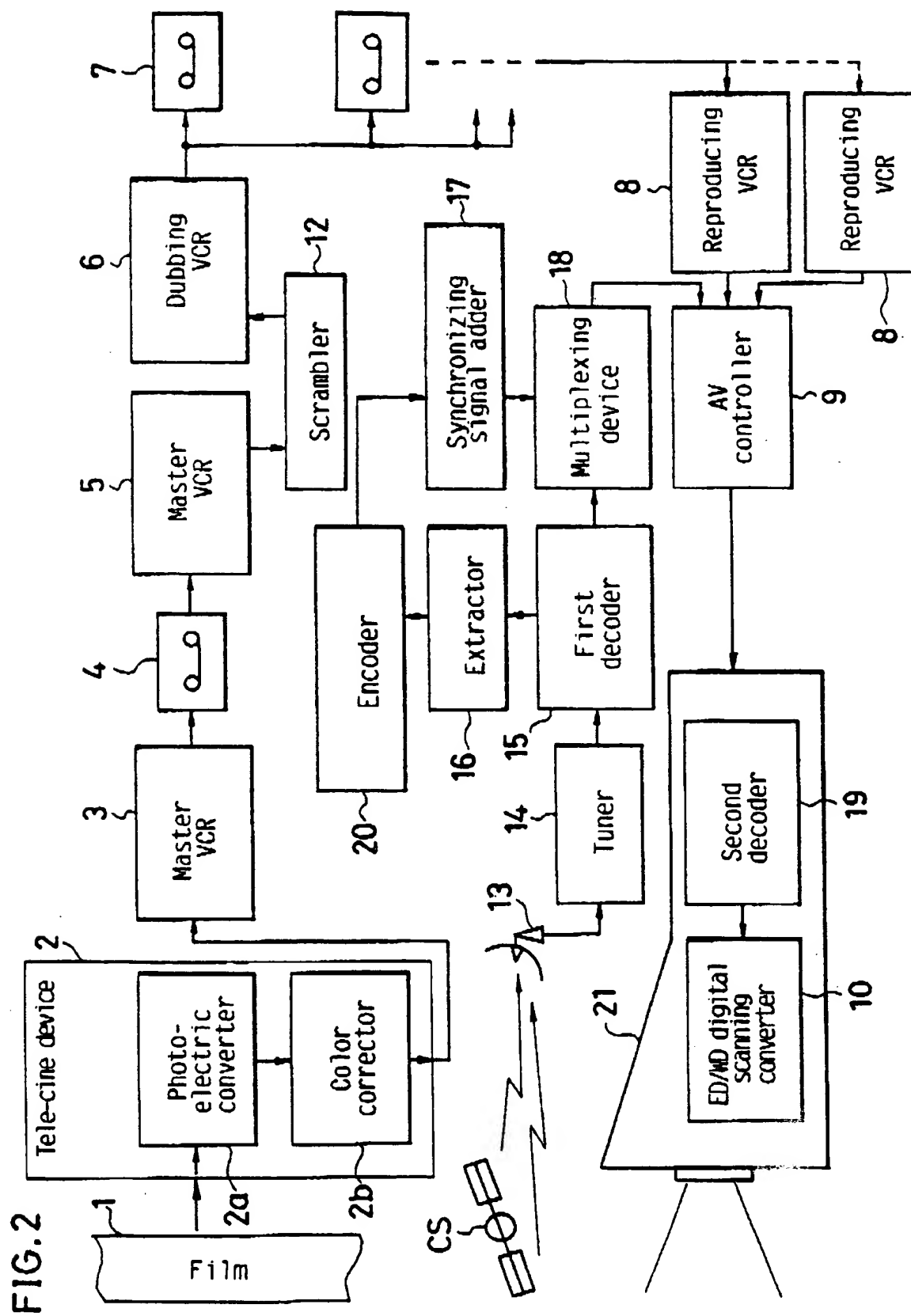




FIG. 3

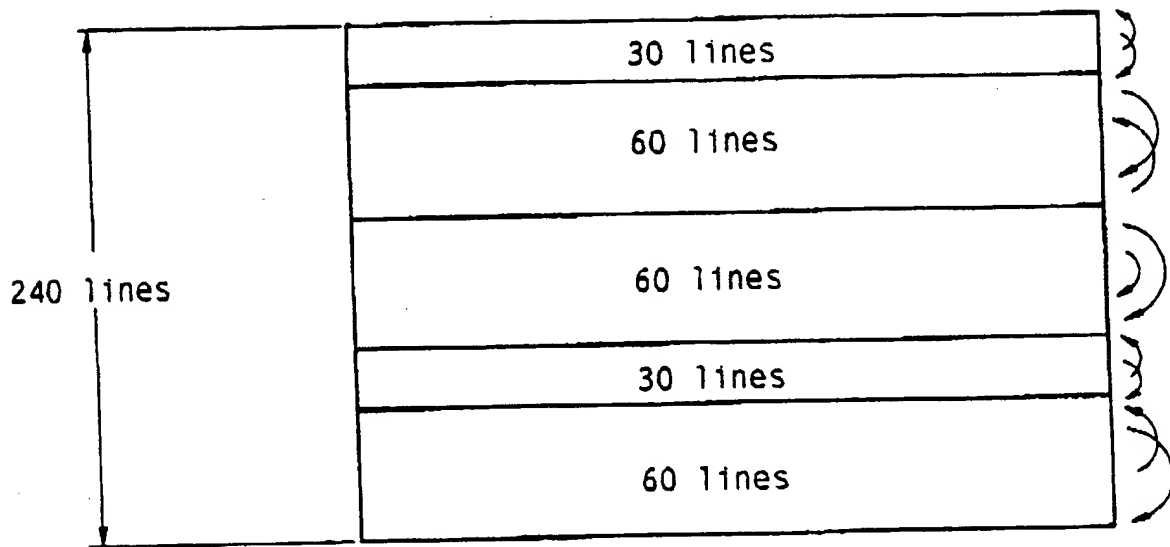
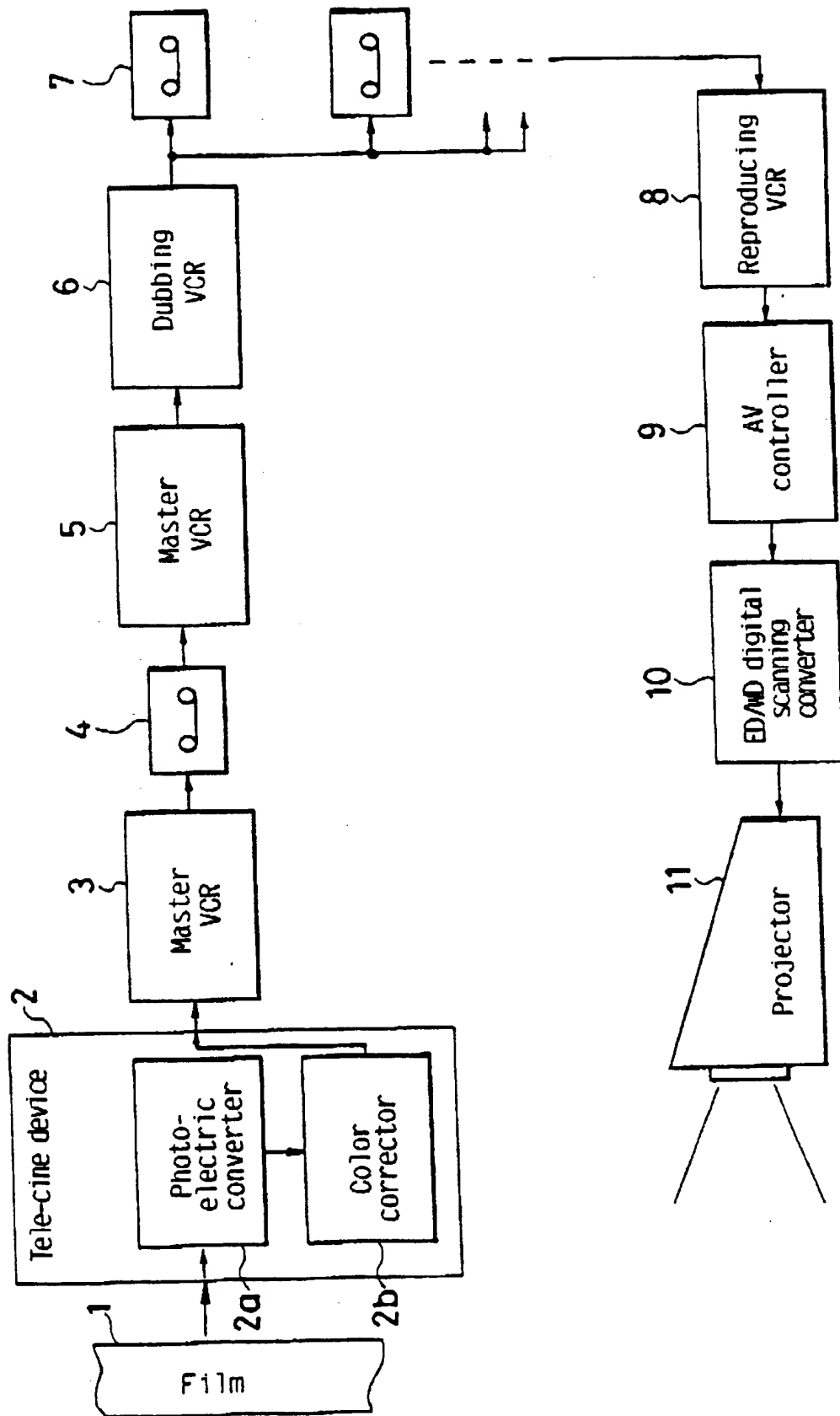


FIG. 4(Prior Art)





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## EUROPEAN SEARCH REPORT

Application Number

EP 93 10 0914

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2 609 589 (VIDEOSTONE ELECTRONIQUE) * the whole document *	1-4,7	H04N5/782 H04N5/91
A	US-A-4 405 942 (BLOCK ET AL.) * column 5, line 6 - column 6, line 28; figures 1A-2 *	2-4	
A	GB-A-2 131 000 (SONY CORPORATION) * the whole document *	1,3-6	
P,A	EP-A-0 519 320 (MATSUSHITA ELECTRIC INDUSTRIAL CO) * the whole document *	1-4,7	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H04N
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 MAY 1993	Examiner VERLEYE J.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document			

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